

Docket No.: 271783US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
Yoshiaki KUMAMOTO, et al. : EXAMINER : FORTUNA, J.A.
SERIAL NO: 10/534,047 :
FILED: NOVEMBER 22, 2005 : ART UNIT: 1791
FOR: MOLDED SHEET

DECLARATION UNDER 37 C.F.R. §1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313-1450

SIR:

Now comes Yoshiaki Kumamoto who deposes and states that:

1. I am a graduate of Shinshu University and received my Master's degree in the field of fiber chemical engineering in the year 1991.
2. I have been employed by the Kao Corporation for 18 years in the field of material development.
3. I am a named inventor of the above-identified application.
4. I understand the English language or, at least, that the contents of the Declaration were made clear to me prior to executing the same.

5. The following experiments were carried out by me or under my direct supervision and control.

6. A key feature of the presently claimed invention is that the molded sheets (a) contain at least an oxidizable metal, a moisture retaining agent, and a fibrous material and (b) have a content of components other than the fibrous material of 50% by weight or higher, a thickness of 0.08 to 1.2 mm, and a breaking length of 100 to 4000 m. Important to these molded sheets is the delicate balance of the three parameters in (b): the fibrous material content, thickness, and/or breaking length limitations, which is neither disclosed nor suggested by the references, individually or in combination, cited in the Office Action mailed December 16, 2008.

7. In the specification, the following Tables 1-3 are provided at pages 19, 26, and 27, respectively:

TABLE 1

	Formulation (wt%)					CSR (ml)	Immobilizing Ratio (%)	Content of Components Other than Fibrous Material (wt%)
	Oxidizable Metal	Fibrous Material	Moisture Retaining Agent	Flocculant (parts)	Electrolyte			
Example	1	75	10	0.75	0	300	*	*
	2	75	10	0.75	0	20	94	89
	3	75	10	0.75	0	150	83	88
	4	75	10	0.75	0	150	87	89
	5	75	10	0.75	0	300	*	*
	6	75	10	0.75	0	460	69	85
	7	58	30	12	0.75	0	300	*
	8	58	30	12	0.75	0	150	94
	9	75	10	15	0.75	0	300	*
Comparative	1	75	10	15	0.75	0	150	89
	2	75	10	15	0.75	0	150	**
	3	75	10	15	0.75	0	720	46
	4	75	10	15	0.75	3	720	32
	5	33	60	7	0.75	0	460	96

* Unmeasurable because molding was carried out by continuous papermaking using a papermaking machine.

** Unmeasurable due to a failure to mold into a sheet.

TABLE 2

		Molded Sheet						Molding* Properties
	Molding Method	Thickness (mm)	Basis weight (g/m ²)	Breaking Length (m)	Number of Flexes	Angle at Break(°)		
Example	1 papermaking machine	0.14	110	780	≥200	90	A	
	2 handsheet machine	0.62	464	342	≥200	90	A	
	3 handsheet machine	0.52	388	280	≥200	90	A	
	4 handsheet machine	1.02	822	317	5-100	80	A	
	5 papermaking machine	0.14	120	780	≥200	90	A	
	6 handsheet machine	0.46	327	239	≥200	90	A	
	7 handsheet machine	0.17	112	1214	≥200	90	A	
	8 handsheet machine	0.62	433	1555	≥200	90	A	
	9 papermaking machine	0.18	133	147	≥200	90	A	
	1 handsheet machine	1.60	1277	257	2	40	B	
Comparative Example	2 handsheet machine	0.05	40	unmeasurable	unmeasurable	unmeasurable	C1	
	3 handsheet machine	0.38	247	126	≥200	90	C2	
	4 handsheet machine	0.35	153	144	≥200	90	C2	
	5 handsheet machine	0.66	468.0	4179	≥200	90	A	

* A: good

B: Much time is needed for dewatering and drying because of large thickness.

C1: Failure to form pin hole-free sheet with uniform thickness.

C2: Large material loss due to poor fixability for powder, etc.

TABLE 3

		Heat Generating Sheet			
		Number of Stacked Molded Sheets	Highest Reachable Temp. (°C)	Duration of Maintaining at ≥40°C (min)**	Amount of Generated Steam (mg)
Example	1	2	44	1.5	102
	2	1	73	4.5	344
	3	1	70	4.5	282
	4	1	81	6.3	681
	5	5	78	5.7	364
	6	1	64	4.3	225
	7	2	43	3.1	149
	8	1	43	5.3	137
	9	3	59	3.7	187
Comparative Example	1	1	79	9.8	806
	2	1	unmeasurable	unmeasurable	unmeasurable
	3	1	41	0.5	106
	4	1	28	0.0	58
	5	1	26	0.0	64

** The time period in which heat generation to 40°C or higher was sustained

8. The foregoing data illustrate the criticality, at least, with respect to the thickness (Examples 1-9 vs. Comparative Examples 1 and 2) and the breaking length (Examples 1-9 vs. Comparative Example 5).

9. To further illustrate the criticality of the balance of the content of components other than the fibrous material, the thickness, and the breaking length, additional experiments were performed. The Experimental protocols for these new experiments are based on the description provided for Example 1 on pages 20-23 of the present application with modifications in the breaking length, powder content, and thickness as shown in the following "additional data" table.

10: The results of these additional experiments are as follows:

Additional Data									
TEST Condition					Results (Expectation)				
	Breaking Length(m)	Powder Content(%)	Thickness (nm)	Number of Flexes	Angle at break	Peeled off evaluation	Maximum Temperature(°C)	Duration of Maintaining 40°C or higher Temperature (min)	Amount of steam generation(mg at 10min)
1 Example 10	195	60	0.47	30	90	B	48.5	9.4	224
2 Compar. 6	45	60	0.65	39	90	C	42.0	4.8	117
3 Example 11	2589	60	0.47	>200	90	A	44.6	14.2	125
4 Example 12	195	60	0.47	30	90	B	48.5	9.4	224
5 Compar. 7	509	40	0.62	29	90	B	29.4	0	86
6 Example 13	195	60	0.47	30	90	B	48.5	9.4	224
Compar. Example 8	Unmeasurable	60	0.05	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable
8 Compar. Example 9	247	60	1.74	1	30	B	46.1	12.1	184
9 Example 10	Unmeasurable	40	0.05	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable
10 Compar. Example 11	Unmeasurable	60	0.05	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable
11 Compar. Example 12	Unmeasurable	40	0.05	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable	Unmeasurable
12 Compar. Example 13	272	40	2.0	1	60	B	30.6	0	90
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Peeled off evaluation:

(1) Transparent adhesive tape (24mm width) was attached on the pulp sheet.

(2) The adhesive tape was pressed by a roller (400g weight).

(3) The roller was 30s and backed once on the tape.

(4) The transparent adhesive tape was removed and was observed to the naked eye.

(5) Criteria A: Pulp and iron powder were barely observable on the adhesive tape.

B: Pulp and iron powder were observable on the adhesive tape and quality was carried on.

C: Much pulp and iron powder were observable on the adhesive tape and quality was inferior.

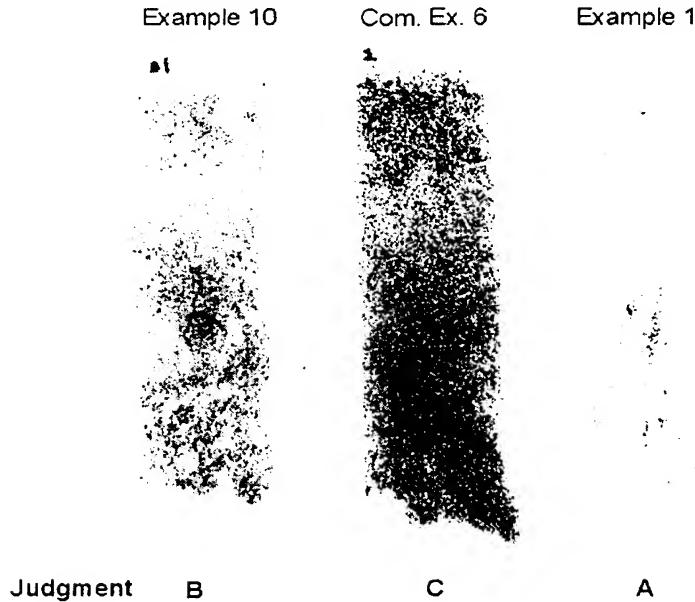
11. With respect to the criticality of the breaking length (i.e., a breaking length of 100 to 4000 m), reference is made to Example 2, Example 8, Example 10, Example 11, Comparative Example 5 and Comparative Example 6. The Test conditions for these examples are provided, in part, in the following table for convenience:

Sample	Breaking Length (m)	Basis Weight	Thickness (mm)	Number of flexes	Angle of break	Molded properties	Peeled off evaluation	Duration of Maintaining at $\geq 40^{\circ}\text{C}$ (min)**	Amount of Generated Steam (mg)
Ex. 2	342	464	0.62	≥ 200	90	A		4.5	344
Ex. 8	1555	433	0.62	≥ 200	90	A		5.3	137
Ex. 10	195	430	0.47	30	90		B	9.4	224
Ex. 11	2589	406	0.55	≥ 200	90		A	14.2	125
CE. 5	4179	468	0.66	≥ 200	90	A		0.0	64
CE. 6	45	396	0.47	39	90		C	4.8	177

From the foregoing and the discussion on page 27 of the specification, all the heat generating sheets prepared by using the molded sheets meeting the claimed breaking length limitation exhibited superior heat generation characteristics, that is, they maintained temperatures of 40°C or higher for a longer period of time and/or generated more steam as compared to the comparative examples where the breaking length is either above (Comparative Example 5) or below (Comparative Example 6) the claimed range of 100 to 4000 m. Furthermore, the molded sheets of the present invention had high flexibility even after heat generation reaction. In contrast, the heat generating sheets obtained in Comparative Example 5 (breaking length above the claimed range) had the following defects: was inferior in both heat generation characteristics and steam generation characteristics.

Noting that Comparative Example 6 showed a good number of flexes, the peeled off evaluation was added for the additional data in the table in paragraph 10 above. The results appear in the following figure:

Peeled off evaluation results on the adhesive tape



These results clearly illustrate that when the breaking length is below the claimed range, the resulting molded sheet has inferior properties as compared to when the breaking length is within the claimed range.

12. With respect to the criticality of the powder content (i.e., content of components other than the fibrous material of 50% by weight or higher), reference is made to Example 12 and Comparative Example 12 appearing in the table in paragraph 10 above. In this table it is clearly illustrated that all the heat generating sheets prepared by using the molded sheets meeting the claimed powder content limitation exhibited superior heat generation characteristics, that is, they reached higher temperatures, maintained temperatures of 40°C or higher for a longer period of time, and generated more steam as compared to the comparative examples where the powder content was below the claimed amount (Comparative Example 7).

13. With respect to the criticality of the thickness (i.e., thickness of 0.08 to 1.2 mm), reference is made to Examples 1-9 and Comparative Examples 1 and 2 in the specification, as well as new Example 13 and Comparative Examples 8 and 9. These results clearly illustrate that when the thickness is outside the claimed range, even though heat and steam generation may be satisfactory, the molded sheet was so brittle that it broke easily and had poor molding properties. This is most directly shown in new Example 13 and Comparative Examples 8 and 9 where the only variable substantially modified was the thickness.

14. None of the art of record provides any disclosure or suggestion of the importance of any one of the content of components other than the fibrous material, the thickness, and the breaking length. In addition, none of the cited references provide a basis to conclude that by maintaining the content of components other than the fibrous material of 50% by weight or higher, a thickness of 0.08 to 1.2 mm, and a breaking length of 100 to 4000 m, molded sheets having superior heat generating, steam generating, and/or molding properties could be obtained. Thus, the results set forth in the specification and in this Declaration would not be expected in view of the cited art in the Office Action mailed December 16, 2008.

15. I declare further that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

16. Further Declarant saith not

Yoshiaki Kumamoto
Name: Yoshiaki Kumamoto

16. June 2009
Date